

AD-A113 198

ROYAL SIGNALS AND RADAR ESTABLISHMENT MALVERN (ENGLAND) F/8 13/8
A CHEMICAL MILLING METHOD OF PRODUCING THIN WALLED WAVEGUIDE TH-ETC(U)
FEB 82 N HARRIS
RSRE-MEMO-3438

UNCLASSIFIED

DRIC-BR-82721

NL

[GFI]
AL
DISCOP



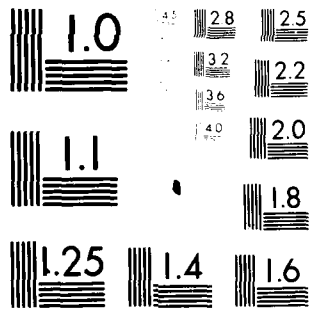
END

DATE

FILED

1982

DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

UNLIMITED

BR82721

②



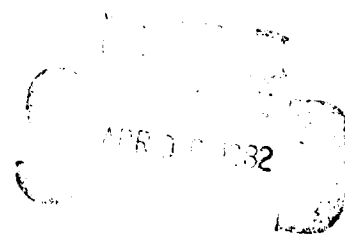
RSRE
MEMORANDUM No. 3438

ROYAL SIGNALS & RADAR ESTABLISHMENT

A CHEMICAL MILLING METHOD OF PRODUCING THIN WALLED
WAVEGUIDE THERMAL ISOLATING SECTIONS

Author: N Harris

PROCUREMENT EXECUTIVE,
MINISTRY OF DEFENCE,
RSRE MALVERN,
WORCS.



UNLIMITED

6

AD A113198

RSRE MEMORANDUM No. 3438

Memorandum 3438

SUMMARY

The process permits flange machining and lapping of the relevant component to be completed prior to the reduction of the wall thickness, thereby eliminating the possibility of damage to the fragile section during these operations.

Accession For
 1915
 1916
 1917
 1918
 1919
 1920
 1921
 1922
 1923
 1924
 1925
 1926
 1927
 1928
 1929
 1930
 1931
 1932
 1933
 1934
 1935
 1936
 1937
 1938
 1939
 1940
 1941
 1942
 1943
 1944
 1945
 1946
 1947
 1948
 1949
 1950
 1951
 1952
 1953
 1954
 1955
 1956
 1957
 1958
 1959
 1960
 1961
 1962
 1963
 1964
 1965
 1966
 1967
 1968
 1969
 1970
 1971
 1972
 1973
 1974
 1975
 1976
 1977
 1978
 1979
 1980
 1981
 1982
 1983
 1984
 1985
 1986
 1987
 1988
 1989
 1990
 1991
 1992
 1993
 1994
 1995
 1996
 1997
 1998
 1999
 2000
 2001
 2002
 2003
 2004
 2005
 2006
 2007
 2008
 2009
 2010
 2011
 2012
 2013
 2014
 2015
 2016
 2017
 2018
 2019
 2020
 2021
 2022
 2023
 2024
 2025
 2026
 2027
 2028
 2029
 2030
 2031
 2032
 2033
 2034
 2035
 2036
 2037
 2038
 2039
 2040
 2041
 2042
 2043
 2044
 2045
 2046
 2047
 2048
 2049
 2050
 2051
 2052
 2053
 2054
 2055
 2056
 2057
 2058
 2059
 2060
 2061
 2062
 2063
 2064
 2065
 2066
 2067
 2068
 2069
 2070
 2071
 2072
 2073
 2074
 2075
 2076
 2077
 2078
 2079
 2080
 2081
 2082
 2083
 2084
 2085
 2086
 2087
 2088
 2089
 2090
 2091
 2092
 2093
 2094
 2095
 2096
 2097
 2098
 2099
 2100
 2101
 2102
 2103
 2104
 2105
 2106
 2107
 2108
 2109
 2110
 2111
 2112
 2113
 2114
 2115
 2116
 2117
 2118
 2119
 2120
 2121
 2122
 2123
 2124
 2125
 2126
 2127
 2128
 2129
 2130
 2131
 2132
 2133
 2134
 2135
 2136
 2137
 2138
 2139
 2140
 2141
 2142
 2143
 2144
 2145
 2146
 2147
 2148
 2149
 2150
 2151
 2152
 2153
 2154
 2155
 2156
 2157
 2158
 2159
 2160
 2161
 2162
 2163
 2164
 2165
 2166
 2167
 2168
 2169
 2170
 2171
 2172
 2173
 2174
 2175
 2176
 2177
 2178
 2179
 2180
 2181
 2182
 2183
 2184
 2185
 2186
 2187
 2188
 2189
 2190
 2191
 2192
 2193
 2194
 2195
 2196
 2197
 2198
 2199
 2200
 2201
 2202
 2203
 2204
 2205
 2206
 2207
 2208
 2209
 2210
 2211
 2212
 2213
 2214
 2215
 2216
 2217
 2218
 2219
 2220
 2221
 2222
 2223
 2224
 2225
 2226
 2227
 2228
 2229
 2230
 2231
 2232
 2233
 2234
 2235
 2236
 2237
 2238
 2239
 2240
 2241
 2242
 2243
 2244
 2245
 2246
 2247
 2248
 2249
 2250
 2251
 2252
 2253
 2254
 2255
 2256
 2257
 2258
 2259
 2260
 2261
 2262
 2263
 2264
 2265
 2266
 2267
 2268
 2269
 2270
 2271
 2272
 2273
 2274
 2275
 2276
 2277
 2278
 2279
 2280
 2281
 2282
 2283
 2284
 2285
 2286
 2287
 2288
 2289
 2290
 2291
 2292
 2293
 2294
 2295
 2296
 2297
 2298
 2299
 2300
 2301
 2302
 2303
 2304
 2305
 2306
 2307
 2308
 2309
 2310
 2311
 2312
 2313
 2314
 2315
 2316
 2317
 2318
 2319
 2320
 2321
 2322
 2323
 2324
 2325
 2326
 2327
 2328
 2329
 2330
 2331
 2332
 2333
 2334
 2335
 2336
 2337
 2338
 2339
 2340
 2341
 2342
 2343
 2344
 2345
 2346
 2347
 2348
 2349
 2350
 2351
 2352
 2353
 2354
 2355
 2356
 2357
 2358
 2359
 2360
 2361
 2362
 2363
 2364
 2365
 2366
 2367
 2368

Copyright
C
Controller HMSO London

1982

A CHEMICAL MILLING METHOD OF PRODUCING THIN WALLED WAVEGUIDE THERMAL ISOLATING SECTIONS

N Harris

CONTENTS

- 1 INTRODUCTION
- 2 CHEMICAL MILLING PROCEDURE
- 3 PROTECTIVE REINFORCEMENT

REFERENCES

1 INTRODUCTION

Thermal isolating sections as used in UK National Microwave Standards require waveguide assemblies in which the wall thickness is required to be reduced to 0.10 mm (0.004 ins) in one or more areas of the waveguide.

Previously the thin walled sections were produced by electroforming and machining which involved the manufacture of high cost mandrels and unavoidably long electroforming time.

The fragile thin walled sections produced presented handling problems during the machining and lapping processes, also rippling of the walls occurred during mandrel withdrawal.

The introduction of a chemical milling process has proved to be highly successful, standard waveguide sections have replaced electroforms, the process is carried out easily and quickly and the thin walled areas are produced as a final operation after all flange machining and lapping has been completed.

2 CHEMICAL MILLING PROCEDURE

Masking

Mask off using Lacomite⁽¹⁾ stopping off medium, air ¹ repeat. As an additional protection for the precision lapped flange faces ² for sealing off waveguide apertures and fixing holes seal off flange ends with plating tape⁽²⁾.

Etching and Measurement

Submerge in Plutinex⁽³⁾ stripper solution (40% nitric acid, 45% fluoboric acid) until the desired wall thickness is achieved. With new solution erosion rate being approximately 25 μ m (0.001 ins) per 3 $\frac{1}{4}$ mins.

During final stages of etching period micrometer measurements are necessary and the finished guide width can be controlled to better than 50 μ m (0.002 ins) ie 25 μ m (0.001 ins) on wall thickness.

Measurements should be taken along edge of waveguide thereby eliminating possible distortion of the final fragile walls and degradation of the internal profile. See figure 1.

Remove from etchant, neutralise and thoroughly wash. Remove Lacomite by immersion in acetone.

3 PROTECTIVE REINFORCEMENT

Reinforce thinned areas as shown in figure 2. "Potting" should not be employed as an alternative, shrinking of the resin will distort the inner profile of the waveguide.

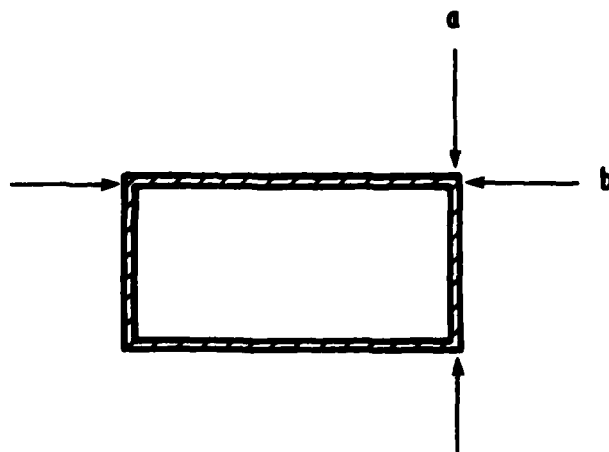
General

Experiments were carried out using nitric acid in various strengths as an alternative etching medium. In all cases etch was irregular with considerable undercutting adjacent to the masked areas.

REFERENCES

- 1 W Canning and Co Ltd.
- 2 Minnesota Mining and Mfg Co - Scotch Brand.
- 3 Schloetter Co Ltd, Abbey Works, Pershore, Worc's.

RT 



W/G SIZE	DIM a (INS)	DIM b (INS)
18	.319 TO .321	.630 TO .632
22	.148 TO .150	.288 TO .290
27	.060 TO .062	.110 TO .112
29	.041 TO .043	.073 TO .075
30	.034 TO .036	.059 TO .061

FIG. 1

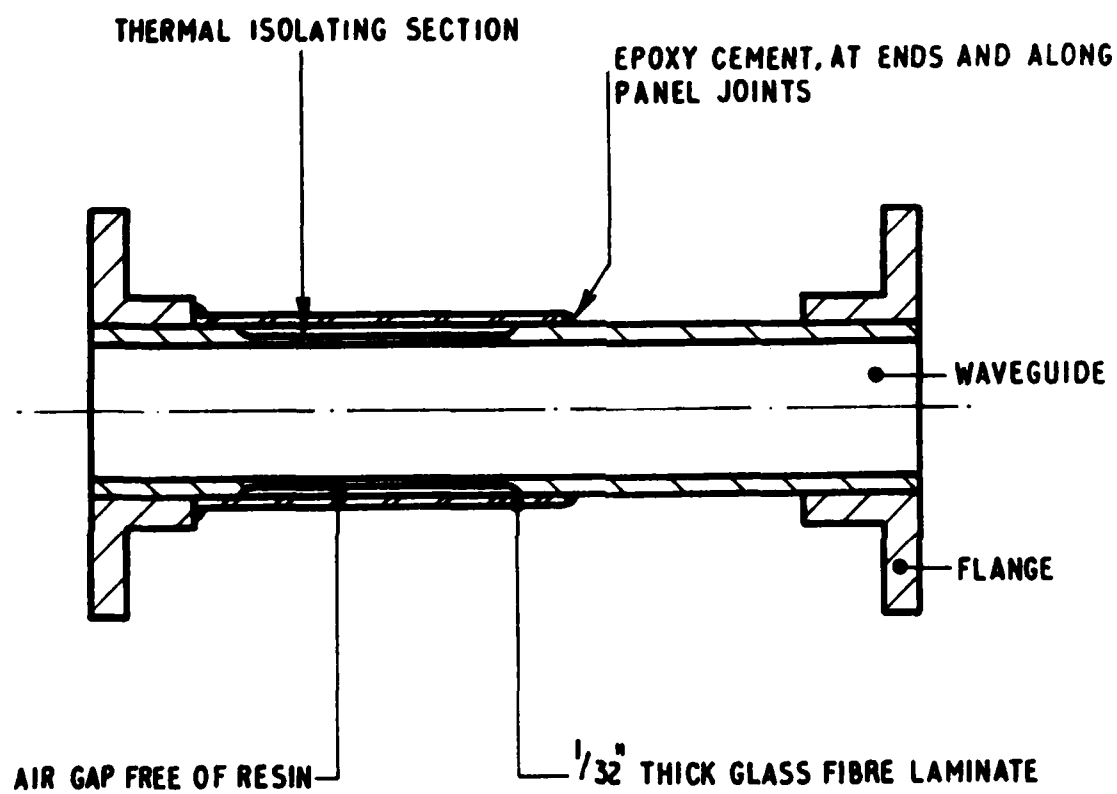


FIG. 2